SMITH'S WOOD ACADEMY

Home learning activities

Subject
Science
Year Group
Year 9
Unit of work / Knowledge organiser
Atoms and the Periodic Table
Activities

- Read through Sections 1-5 of the 'Atoms and the Periodic Table' 'Knowledge Organiser' and make careful and detailed notes on the sections, including the definitions in Section 1 and the keywords in Section 5.
- Read through Sections 6-9 of the 'Atoms and the Periodic Table' 'Knowledge Organiser' and make careful and detailed notes on the sections, including the 'timeline' in Section 6 and the table of properties of metals and non-metals in Section 7.
- Write out the keywords from Section 5 from memory, including their definitions.
- Watch all 'GCSEPod' clips on the 'Atomic Structure and the Periodic Table' Unit.
- Complete the 'GCSEPod' Questions assigned for this Unit of work.
- Sign up for 'Seneca Learning' using the 'Sign Up Guide' sheet and the special passcode: **j5v9tvzq48**. Complete the assignments which have been set.

Where do you complete the work?
Use computer/phone for 'GCSEPod' or 'Seneca' and study materials.
What to do if you finish the work? (Extension activity)

- Complete the 'mini project' on 'Atoms and the Periodic Table'.

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These websites might help:
• BBC Bitesize -> Secondary -> GCSE -> Combined Science -> AQA Trilogy -> Chemistry -> Atomic Structure and the Periodic Table • www.freesciencelessons.co.uk -> GCSE Videos -> Chemistry Paper 1
If you are struggling with your work or if you have finished.
Please email your classroom teacher directly using the email list found in the Home Learning section of the website.

Year 9 — Atoms and the Periodic Table

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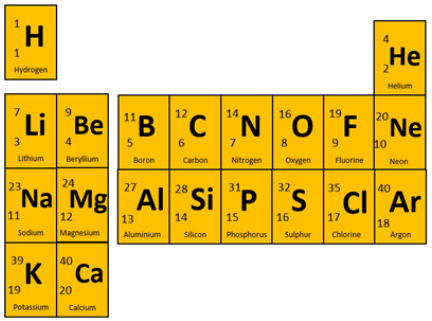
1. All the elements are listed in the **periodic table**.



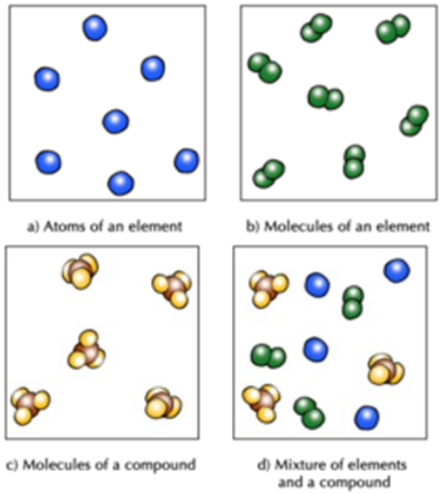
Elements are chemically combined together to make **compounds**. A **chemical reaction** is needed to make an element into a compound.

Elements are made of atoms which are all the same.

Compounds are made of different elements.

If two or more atoms join together by sharing their electrons, they are a **molecule**.

Mixtures are not chemically combined.



2. You can see which elements are in a compound by looking at its **formula**:

Eg. MgO contains Magnesium (Mg) and Oxygen (O)

The word equation would be:

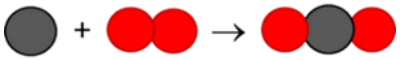
Magnesium + Oxygen —> Magnesium Oxide

The symbol equation would be:

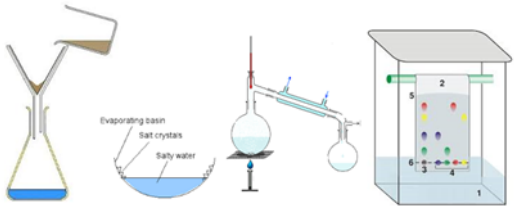
$Mg + O_2 \rightarrow MgO$

We need to make sure this is balanced:

$2Mg + O_2 \rightarrow MgO$

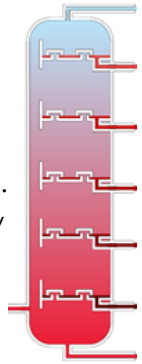


Mixtures can be separated by **physical processes**—they do not require a chemical reaction.



Filtration, crystallisation, distillation, chromatography

Fractional distillation is used to separate different liquids with different boiling points. The tower is cooler towards the top. The gases will raise up until they reach their condensing temperature, where the liquids will run off.



3. Atomic theory has developed overtime:

400BC—**Democritus** described materials as being made of small particles called 'atoms'

1803AD—**Dalton** said all matter is made of atoms and there are different types

1897AD—J.**J. Thompson** discovered the **electron**. Proposed the 'Plum pudding' model where negative electrons were embedded in a ball of positive charge

1911AD—**Rutherford** suggested the atom has a positively charged nucleus and much of the atom was empty space

1913AD—**Nells Bohr** explained that electrons orbited the nucleus at specific distances

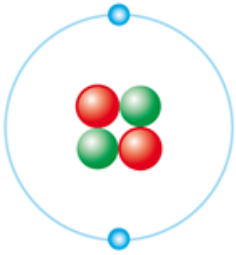
1932AD—**James Chadwick** discovered the **neutron**

The structure of the atom		
	Relative charge	Relative Mass
Electron	-1	0.0005
Proton	+1	1
Neutron	0	1

Protons and neutrons = NUCLEUS

Electrons = ORBIT NUCLEUS IN SHELLS

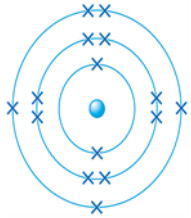
4. Atomic (proton) number is the number of protons in an atom.
Mass number is the number of protons and neutrons in an



	Atomic number	Mass number	Number of protons	Number of electrons	Number of neutrons
Carbon	6	12	6	6	6
Fluorine	9	19	9	9	10
Sodium	11	23	11	11	12

Isotopes of an atom have the same number of protons and electrons, but a different number of neutrons. **The relative atomic mass** (A_r) is the mass of the different isotopes of an element.

$A_r = \frac{\text{(Mass x \% of isotope 1) + (Mass x \% of isotope 2)}}{100}$



Electrons occupy shells:
1st shell = 2 electrons
2nd shell = 8 electrons
3rd shell = 8 electrons
The electron structure can be numbered. Eg. 2,8,2 = Mg

If an atom loses an electron it becomes charged. The charged particle is called a positive **ion**

5. Keywords

Element – a substance that cannot be broken down chemically
Compound – a substance that contains at least two different elements, chemically combined in fixed proportions
Molecule – two or more atoms joined together sharing electrons
Proton – found in the nucleus of an atom. Has a charge of +1.
Neutron – found in the nucleus of an atom. Has no charge
Electron – orbits the nucleus of an atom in shells. Has a charge of -1.
Atomic (proton) number - the number of protons in an atom.
Mass number - the number of protons and neutrons in an atom.

Year 9 — Atoms and the Periodic Table

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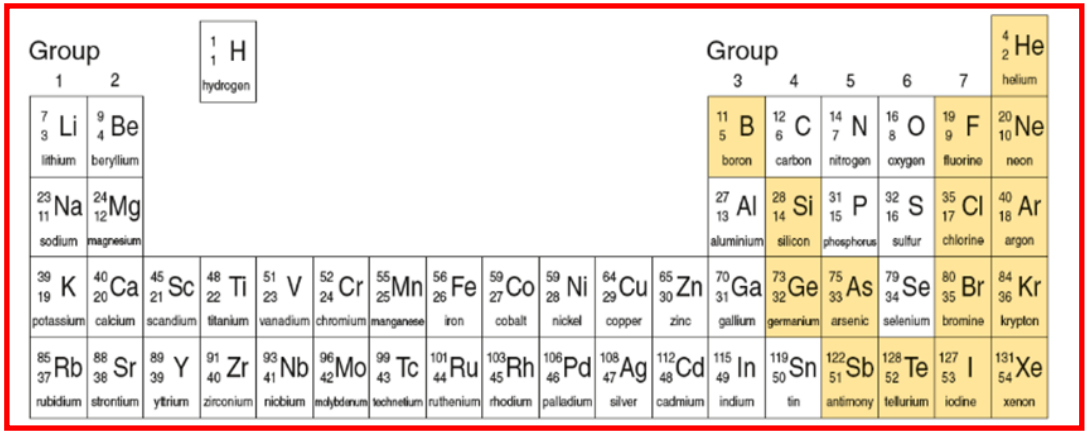


6. The **periodic table** is arranged by the atomic (proton) number.
The **groups go down** the periodic table. Elements in the same group have the same number of electrons in their outer shell, but a different number of shells.

The **periods go across** the periodic table. Elements in the same period have the same number of shells, but a different number of electrons in their outer shell.

The periodic table has developed over time:

Some elements have been known since ancient times

1829AD—**Döbereiner** arranged elements into 'triads' based on their properties. This only worked for very few elements (Li, Na, K & Cl, Br, I)

1860AD—new list of more accurate atomic weight published

1865AD—**John Newlands** noticed that when elements were ordered by atomic weight, there was often a pattern of similar properties every eight elements **'law of octaves'**

1869AD—**Dimitri Mendeleev** also discovered by atomic weights BUT he left gaps for elements which hadn't been discovered yet

1932AD—Discovery of isotopes fully explained why atomic number is used

7. Metals are found to the left of the periodic table. **Non-metals** are found to the right

Physical properties:

Metals	Non-metals
Lustrous	dull
Hard (with the exception of mercury which is a liquid at room temperature)	Soft, brittle, liquids or gas (for most non-metals at room temperature)
High tensile strength	Low or no tensile
High melting & boiling point	Low melting & boiling point
Good conductors of heat	Poor or no thermal conductivity
Good electrical conductivity	Poor or non conductors of electricity (with the exception of Carbon)

Chemical properties:

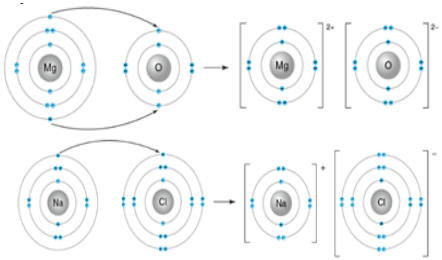
Metals	Non-metals
React with oxygen to make oxides	React with oxygen – eg carbon and oxygen make carbon dioxide
React with acid to make salt	

8. Sulfur & phosphorus both react with oxygen to make oxides. Both sulphur dioxide & phosphorus oxide turn universal indicator red. They are acidic oxides.

Calcium & potassium both react with oxygen to make oxides. Both calcium oxide turn universal indicator blue. They are basic oxides.

Metals form basic oxides. Non-metals form acidic (or neutral) oxides.

Ions are charged particles. Metals **lose electrons** to form positive ions. Non-metals **gain electrons** to form negative



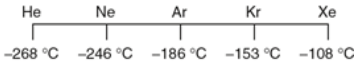
Patterns in reactivity:

Group 0
Helium (He)
Neon (Ne)
Argon (Ar)
Krypton (Kr)
Xenon (Xe)

Group 0 elements have 2 things in common:

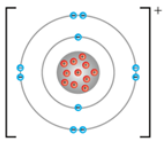
- They are all gases
- They are all unreactive (because they have a full outer shell)

The boiling points increase down the group



Group 1 elements **(alkali metals):**
React vigorously with water to make hydrogen and a metal hydroxide (increases down group)

$2Na + 2H_2O$ —> 2Na



Burn in oxygen to form oxides

Make ions with a + 1 charge

7 3 Li lithium
23 11 Na sodium
39 19 K potassium
85 37 Rb rubidium

9. Group 7 elements (**halogens**)

- Non-metals
- Exist as pairs (F_2, Cl_2, Br_2 & I_2)
- React vigorously with metals (reactivity decreases down group)

Potassium + Chlorine —> Potassium Chloride

2K + Cl —> 2KCl

- React with metals to make salts
- React with non-metals to make gases or liquids such as acids
- **More reactive halogens will displace less reactive halogens in metal halide solutions**
- **Gas** (F_2, Cl_2) **Liquid** (Br_2) **Solid** (I_2)

19 9 F fluorine
35 17 Cl chlorine
80 35 Br bromine
127 53 I iodine
210 85 At astatine

The reactivity in groups 1 & 7 are in opposite directions.

- Reactivity increases down group 1 because outer electrons get further away from the nucleus as you go down the group, so there is less 'pull' on it. This means it is lost more easily.
- Reactivity decreases down group 7 because outer electrons get further away from the nucleus as you go down the group, so it is harder for the nucleus to pull electrons in to make a full outer shell.

Transition metals are found between groups 2 and 3.

- They have typical metal properties
- They are often used as catalysts

- Iron is used in the Haber process to make ammonia
- Nickel is used in the manufacture of margarine

- Compounds are often coloured

Compound	Copper	Iron (II)	Iron (III)	Nickel
Colour	Blue	Pale green	Orange/ Brown	Green

‘Seneca Learning’ Sign-Up Guide

Passcode: j5v9tvzq48

Step 1: Open an internet browser - *Any browser except Internet Explorer will work.*

Step 2: Go to SenecaLearning.com

Step 3: Click on “Get Started” or “Sign Up”

Step 4: Create your account - *If you don’t know your parent email, then type: N/A.*

Step 5: Click on “Classes & Assignments” - *You’ll find this in the top menu.*

Step 6: Click on “Join Class” - *It’s the green button in the top right corner.*

Step 7: Type the code from your teacher - *If you received a link instead, then open the link.*

Atoms & the Periodic Table – Mini Project

Watch this video: https://www.youtube.com/watch?v=nxRGahK7B48

Task	Description
1	Create a decorative cover sheet for your project using pictures and as many keywords from the topic as possible.
2	Draw or print a table to show the similarities and the differences between man-made and natural materials, also include three examples for each
3	Produce a leaflet to show a diagram of atoms of an element such as iron or zinc
4	Draw or print the periodic table and label the sections of metals and the non-metals .Label and name the groups of the periodic table
5	Draw or print a table for ten metal elements with their symbols and ten non-metal elements with their symbols
6	Find the definition of a compound and write down he names of three compounds and state the difference between a compound and a mixture
7	Draw a poster to show the difference between chemical and physical changes. Include an example for each. State how to identify a chemical change.
8	Name different compounds and molecules and list the rules for naming compounds with examples for each.